PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

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STORAGE OF CO_2 IN THE GEOLOGIC FORMATIONS IN THE OHIO RIVER VALLEY REGION

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Background

Storage of carbon dioxide (CO_2) in a dense, supercritical phase in deep saline sandstone formations is deemed to be a very promising long-term option for sequestration. Deep saline formations are among the largest and most widely available potential reservoirs for long-term storage. Usable formations are known to exist underneath much of the continental U.S. and under the oceans. In both locations, these formations appear to have abundant disposal capacity. Moreover, many of these formations are often located in close proximity to major point sources of CO_2 emissions such as fossil-fuel power plants, which has the benefit of reducing transportation costs of CO_2 to the injection site.

During the 1990s, Battelle researchers were some of the first scientists to be supported by the U.S. Department of Energy's National Energy Technology Laboratory to explore the potential of using deep geologic formations as a means of sequestering CO_2. The current project is in Phase III of Battelle's research; the first two Phases were funded under the "Global Climate Change - Novel Concepts for Management of Greenhouse Gases" program. Commencement of this effort underscores the progression of DOE's geologic sequestration program from computer and laboratory assessment towards pilot-scale testing and verification. Phase III is focused on a site characterization (surface and subsurface) for possible injection of CO_2 into a suitable formation.

In this project, the research team is planning a field study to determine whether the deep rock layers in the Ohio River Valley are suitable for storing carbon dioxide. The research team includes American Electric Power (AEP), which owns and operates the Mountaineer plant (the host site for the research project); Battelle, a non-profit organization, headquartered in Columbus Ohio, and is a global leader in technology development; the U.S. Department of Energy; BP; Schlumberger, and Pacific Northwest National Laboratory. The Ohio Coal Development Office of the Ohio Department of Development (OCDO) is also providing support to the project, given the potential to address future carbon emissions from the many coal-based electricity power plants in Ohio and to retain the jobs that these plants and Ohio coal mines support. Additional technical support is being provided by researchers from the West Virginia University, the Ohio Geological Survey, and several technology vendors. If the studies show that storing carbon dioxide deep underground in the Ohio River Valley will be safe, practicable, and effective, AEP and its partners will decide whether to go to the next stage.

Primary Project Goal

The project will involve site assessment to develop the baseline information necessary to make decisions about a potential CO_2 geologic disposal field test and verification experiment at the site. This project will be focused in the Ohio River Valley, which is home to the largest concentration of fossil-fuel fired electricity generation in the nation. Additionally, the potential for long-term sequestration of CO_2 in deep, regional sandstone formations and the integrity of overlying caprock will be evaluated for future sequestration projects. No CO_2 injection is planned during this phase.

PARTNERS AND PERFORMERS

Battelle Memorial Institute

American Electric Power

Pacific Northwest National Laboratory

BP

Ohio Coal Development Office of the Ohio Department of Development

Schlumberger

Ohio Geological Survey

West Virginia University

TOTAL ESTIMATED COST

Total Project Value	$4,172,441
DOE	$3,151,441
Non-DOE Share	$1,021,000

Storage of CO_2 in the Geologic Formations in the Ohio River Valley Region

Objectives

- Thoroughly assess the geologic environment in the Ohio River Valley in order to site a field test.
- Conduct a 2-dimensional seismic survey to delineate subsurface geologic structures.
- Drill an exploratory deep well to collect scientific data to assess the potential for conducting a CO_2 storage test at the site.
- Conduct tests to comprehensively characterize the reservoirs, caprocks, and overlying layers, thereby developing a thorough understanding of the geology, hydrogeology, and geochemistry at the site.
- Prepare the necessary permits and regulatory documents to allow use of the deep well to inject CO_2 captured from a nearby coal-fired power plant.
- Develop and apply a comprehensive Risk Analysis and Stakeholder Involvement Process for the capture, transport, injection, and long-term storage of CO_2 at the field demonstration site.
- Develop a comprehensive monitoring plan to ensure the safe, long-term isolation of CO_2 in deep geologic formations.

Prior Accomplishments

Prior research by Battelle scientists leading up to the current project includes:

- Regional data compilation, reservoir and geochemical simulations, geochemical experiments, and seismic aspects reports have been completed.
- A detailed report on engineering and economic aspects for CO_2 capture and storage has been completed.
- Regional-scale assessments in the Midwest and other regions show that there is enormous potential sequestration capacity in sedimentary basins with favorable formation thickness, hydrogeology, seismicity, and proximity to CO_2 sources. However, site-specific tests and characterization are needed to determined injection potential at individual locations.

Benefits

The Mountaineer Power Plant

Evaluating the feasibility of CO_2 storage at several different scales will allow the energy industry to prove the viability of an evolving U.S. technology that will allow fossil-fuel fired power plants to continue operating well into the future as our nation develops a strategy to deal with the buildup of greenhouse gases in the atmosphere. The project approach will allow the U.S. to more rapidly move the concept of carbon capture and geologic disposal from the laboratory to an industrial-scale demonstration. If the research shows that storage is feasible, it could offer a way for many utilities around the country to significantly reduce their carbon emissions. It will be especially beneficial to states such as West Virginia, Ohio, and many of the large industrial States in the Midwest, which depend heavily on coal for electricity generation. Finally, all aspects of the current project including field characterization, testing, permitting, and monitoring plans development will provide a protocol for similar investigations at other locations in the future.